Sweeping Phase Cancellation Zones for Precision Microwave Imaging via Time-Resolved Negative Absorptiometry

31 August 2025
Simon Edwards
Research Acceleration Initiative

Introduction

Alternatives required to imaging by way of electron microscope as this imaging method requires not only expensive equipment, but damaging living tissues. The study of living things and their structures, be the studies *in vitro* or *in vivo,* requires that the imaging method not cause damage to tissues.

Visible light may be useful for imaging in some cases, but not when the object to be measured or detected is buried within other tissues or when opaque materials must be penetrated.

Abstract

Regardless of the wavelength and phase height of an EM wave, wavelengths of EM, if properly controlled, may be used to create maps of areas smaller than the phase height of the EM. Microwaves are ideal for studying embedded materials and opaque materials given their ability to penetrate the materials.

In order for microwaves to be used to create images with resolutions comparable to that of an electron microscope, a number of techniques must be used in conjunction with one-another, including a technique this author first promulgated when trying to find a way to make microwave ovens more efficient a few years ago. It should be noted that a great deal of heat is generated in these phase cancellation zones, meaning that this would be a safety consideration for *in vivo* imaging. Fortunately, this technique would not require high-powered microwaves.

If we introduce microwaves from a single direction into an object and interaction with any given atom in the material results in a deviation to angular momentum, no matter how exquisite the detectors behind object to be measured, one cannot deduce at what point a deviation to angular momentum was introduced. Even with the benefit of multiple emitters and complex systems of phase-cancellation, there is little to be gained from attempting to infer the characteristics of tissues from deviations to angular momentum or to frequency as living tissues do not have a substantial enough effect upon the frequency of EM or to angular momentum for these properties to be useful metrologically.

However, if we emit a microwave from the opposing direction at a precise enough time relative to the emission of the primary microwave, we can produce phase-cancellation which eliminates the primary EM beginning at a particular point in the mass of the material to be measured. Insofar as any major properties of the EM are altered in a spherical test body in which we

are comparing two hemispheres, the degree to which phase-cancelling is “complete” would be affected.

If, for example, we emit two identical EM waves timed to meet in the exact center of a body composed of a single, uniform material, there should be absolutely no detectable EM after a phase cancellation. If we introduce an asymmetry to the test sphere by adding a material of greater density to one side and not to the other (to simulate a tumor, for example,) this would lead to an imperfect phase cancellation and the subsequent detection of EM in the detectors on the side antipodean to the hemisphere of the test sphere in which the asymmetry is introduced.

A single emission would give us enough information to tell us that the asymmetry exists somewhere in either the left or right hemisphere, for instance. From there, we can shift the *phase cancellation plane* from one side to the other in order to determine where the incongruous biological mass is located through repeated measurements. With enough measurements, we can repeatedly “weigh” the comparative overall effect of the overall biological mass of one hemisphere upon the other in order to determine the precise position of areas of varying composition and density through the process of elimination. One may compare this to trying to create a portrait using a digital camera with exquisite optical contrast and positional specificity of each pixel, but with low resolution. So long as sensitivity to contrast and positional specificity are present, one could eventually create a complete, high-resolution portrait.

Despite the relatively long wavelengths and phase heights of microwaves, the ability to emit those microwaves at extremely precise times relative to one another and the ability to gradually adjust that timing on a scale on the order of attoseconds allows an operator to infer the location of the phase cancellation plane to atomic precision regardless of how coarse the wave may be.

From there, we can move the boundaries of the phase cancellation plane up and down in order to achieve as three-dimensional fix on the position of incongruous masses. This can be used to map everything from blood vessels to nerve fibers to tumors. It might also be used to to efficiently evaluate and reverse-engineer nano-electronic circuits. Required would be two miniaturized OASIC units to support the timing function and a concave microwave detector apparatus capable of resolving the comparative differences in microwave remnants of imperfect phase cancellations.

Conclusion

Phase-cancellation-enabled Time-Resolved Negative Absorptiometry provides an additional potential tool for cutting-edge microscopy which naturally complements other novel methods such as intersecting helical beam fluorescence imaging.